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ABSTRACT

The present study, funded under the Elementary and Secondary Education Act, Title III, was a preliminary investigation of patterns of academic success and failure of American Indian elementary school children. Data on the 157 children in the sample were obtained through parent interviews, testing measures of academic achievement, and several measures of IQ and academic aptitude, teacher ratings, school records, and a measure of the child's self-concept via a projective device. Conventional behavior (CB); functional information, knowledge, and skill (FI); esoteric information (EI); and abstract reasoning and problem solving (AR) were isolated as principal constructs. It was concluded (1) that AR, FI, and CB were related to academic performance; (2) that the existing psychometric instruments do not provide an adequate measure of any of the 3 relevant factors and, in fact, are badly contaminated by factors which are irrelevant to school performance and negatively related to socioeconomic status; (3) that teachers' ratings of performance and potential are influenced by factors irrelevant to actual academic proficiency; and (4) that there is an urgent need for better definition and measurement of the 3 primary factors related to achievement, and to a study of their effects over the school years. Additionally, a model for academic achievement was discussed which could be utilized as a research guide. (HBC)

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An Examination of Factors Responsible for Low Achievement in Indian Elementary School Students

Part I

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Introduction

The present study is a preliminary investigation of patterns of academic success and failure of Indian elementary school children. The writers feel that compensatory education programs have achieved only modest success because "solutions" have been implemented in school programs without critical regard to the basic causes of educational failure. We feel that these causes are as yet unidentified, and our research is directed toward the goal of defining the factors responsible for the low achievement levels and high dropout rates of Indian students. While the target population is comprised of Northcoast California Indians, we feel that our findings ultimately can be generalized to other similar groups.

The research approach we have chosen is relatively simple, although rather tedious and time consuming. We have gathered as much information as possible about each of the children in our study sample because we feel that school performance is a complex behavior and is related to many different aspects of both the school, and child and his life circumstances. To this end we obtained through parent interviews information about the home and parental attitudes; through intensive testing, measures of academic achievement and several measures of IQ and academic aptitude; through teacher ratings, estimates of the child's performance along a number of dimensions; from the school's records, number of absences; and finally a measure of the child's self concept via a projective device. We wish we could have had even more information such as physical health, disciplinary referrals, internal family relationships, but our financial resources were limited. Our study sample consisted of 157 children for which we had all the above information except

individual IQ scores, and of these, 80 for which we had all information. The children were selected from seven schools representative of the Northcoast region. We plan to include eventually a comparable group of non Indian students from the same schools in our sample.

Since we obtained all information for each child in our sample (with the exceptions noted), we were able to intercorrelate all study variables thus portraying the relationship of "everything to everything else." Through a series of factor analysis we identified the major dimensions which principally account for covariances among selected sets of variables. This procedure enabled us to solve, at least partially, the dilemma of knowing that A and B correlate, but not knowing why they do. The factorial structures which emerged from the analysis provide a tentative model of patterns of success and failure in school, and further indicate the relative importance of each study variable to these patterns. The analysis also provides considerable insight as to what specific factors are measured by the IQ tests used in the study, and the results are somewhat surprising.

Below is a summary of the sequence of activities followed by the investigators.

1. selected a broad range of variables which have logical relationships to school success.
2. selected representative schools and solicited their cooperation.
3. selected and trained persons to administer and score tests, conduct interviews and code data.
4. intercorrelated all study variables.
5. factor analyzed numerous sets of intercorrelations to determine their factor structures.

6. from careful study of the factor structures, inferred the general independent dimensions (constructs) which account for common variance among the study variables.

7. expanded these constructs by logical inference from their consistency with facts identified in the present study and from other educational research.

8. constructed models showing how the constructs interact to produce different levels of academic achievement.

9. suggested plans for validating the models, and for applying them to educational practice.

The analysis and interpretation of the raw data are presented in the technical section (Part II) of this report. Immediately following is a discussion of the major constructs developed and their relation to academic achievement.

The Principal Constructs

Conventional Behavior (CB) This complex constellation of characteristics most probably represents aspects of the child's behavior required for successful adjustment to the school situation. The most generally descriptive term could be called conformity. While further research is needed for full explication of the behavior belonging to this dimension, the present study strongly suggests the following characteristics are relevant.

1. Compliance with authority. In general, this means the child's ability to understand, and willingness to comply with, the instructions of established authority figures, e.g. the teacher, examiners, even in those circumstances where the directed activities have no particular meaning to the child. Compliance can be more specifically described as paying close attention to the authority figure, following instructions explicitly, completing assigned tasks on time and in the prescribed manner.

2. Attention to detail. This involves the child's detection of, or responsiveness to, small detail. The process may often necessitate the ignoring of wholes meaningful to the child. Responsiveness to holistic properties may interfere with this function.

3. Conformity to normative social values. In those situations where the child directs his own behavior or makes his own decisions, he is guided by conventional values. This process requires knowledge of such values and, perhaps, their internalization.

4. Conventional organization and sequencing. This means that the child follows accepted models of organization when directing his own activities or arranging given stimuli (without necessarily knowing the value or purpose of such models). Sequencing here means following a given preferred order, temporally or spatially, in self directed activities.

Teachers' ratings of children's achievement levels in reading and arithmetic, degree of motivation in school work and, the quality of their relationships with peers are highly correlated with the Conventional Behavior dimension. Teachers' predictions of future educational and occupational achievement are even more strongly related, although the

relation of estimates of intellectual potential is more moderate. Thus the teacher's estimate of how well a child is doing in school is apparently dependent upon the degree to which that child exhibits the characteristics which we have called Conventional Behavior. If teachers' ratings are equivalent to evaluative grades, then it can be said that grades are significantly dependent on the development and manifestation of patterns of conventional behavior; and any factor which influences either the acquisition or expression of such behavior will likewise effect the school grades which the children receive.

On the other hand, there is only slight relationship between these characteristics (Conventional Behavior) and academic achievement as measured by seven subtests of the California Test of Basic Skills. Over the range studied, grades 2 through 6, academic skill development occurs relatively independently of the development of conventional behavior. Therefore, it can be concluded that teachers' impressions of how well a child is doing in school, and their predictions of future educational and occupational success are strongly influenced by factors which are largely irrelevant to measured academic achievement.

Certain subtests of the Wechsler Intelligence Scale for Children are strongly correlated with the CB dimension, but not significantly with measured academic achievement; namely, Digit Span, Coding, Comprehension, Picture Completion, and Picture Arrangement. Since these subtests contribute substantially to the variance in Verbal, Performance and Total IQ scores, it can be said that these IQ measures reflect nonintellectual factors. The group IQ test used in the study, Short Form Test of Academic Aptitude (SFTAA)

is also correlated with this dimension, but less strongly. Correlations of the IQ test scores with teacher ratings of academic proficiency and educational promise are due in part to the common influence of Conventional Behavior.

Parents' estimates of their childrens' school achievement obtained through parent interviews are correlated with the Conventional Behavior dimension, but only minimally with measured academic achievement. Whether parents were responding to the same aspects of the childrens' behavior as were the teachers or whether they based their judgments on teachers' evaluations communicated through parent-teacher conferences or report cards cannot be determined from our data.

Finally, the child's self concept, as reflected by responses to an Incomplete Sentences Test is correlated with measured achievement, but not with Conventional Behavior. Perhaps the child knows something about himself that his parents and teachers don't know.

Functional Information, Knowledge, and Skill (FI), and Esoteric Information (EI) Three subtests of the WISC, Information, Arithmetic, Vocabulary, and the verbal section of the SFTAA appear to measure what has often been called "general cultural information." Analysis of these tests resulted in their clear empirical differentiation from abstract reasoning, which constitutes the core of traditional definitions of intelligence. Variance in the level of general information probably reflects differences in opportunity to learn more than it does ability to learn, especially when variance is derived from a socioeconomically heterogeneous population.

Factor analysis of selected sets of aptitude (intelligence) measures with CTBS subtests resulted in two types of "information" factors, and all of the above tests had loadings on both types. One type had a significant relation to CTBS test performance while the other did not. The former was identified by the investigators as Functional Information, Knowledge and Skill, (FI), while the latter was called Esoteric Information (EI). FI was hypothesized to constitute a "readiness base" of accumulated information, knowledge or skill necessary for profitable interaction with the school's academic curriculum. EI, however, represents information, required by the tests, which is not relevant to academic performance, and which probably reflects the degree of educational, social and economic advantagedness of the children's parents. The inclusion of esoteric information on intelligence tests increases their socioeconomic bias, and at the same time reduces their relevance to academic performance.

Abstract Reasoning and Problem Solving (AR) This dimension may be defined by the child's ability (1) to analyze complex stimulus configurations and to abstract from these their primary features, or to perceive essential relatedness among sets of complex stimuli; and (2) to apply these capabilities in the solution of practical problems. General Abstract Reasoning, measured only by the Raven Progressive Matricies, is relevant to a wide variety of situations, whether the stimulus context be verbal, graphical-figural, or concrete. Verbal Abstract Reasoning, measured principally by the WISC subtest Similarities, pertains primarily to the analysis of verbal stimuli. Abstract reasoning correlates well with measured achievement, particularly Reading Comprehension and Arithmetic Application. Correlations of Abstract Reasoning with all teachers' ratings are low, except for a moderate rela-

tionship with the dimension Conventional Behavior.

Spatial Relationships - part-whole synthesis. The WISC subtests Object Assembly and Block Design, and the Raven Progressive Matricies are highly correlated with this dimension. These tests are nonverbal, and involve the fitting together of elements to complete a meaningful whole. This dimension is not related to any measure of scholastic success, but is negatively related to the income level of the children's parents.

Measured Achievement In the present study the CTBS was considered to be the most objectivc measure of academic performance and as such, it constituted the criterion against which other measures were evaluated. The CTBS subtests and total scores were entered, one at a time, in correlation matricies with various sets of study variables, and the factor structures which accounted for the intercorrelations were determined. In each such analysis a single factor principally accounted for the explained variance in achievement test (or subtest) scores, hence we named such factors Measured Achievement. Although correlations (factor loadings) of the various study variables with Measured Achievement gave some indication of their relevancy to academic skill development, the relationship of these study variables to other identified dimensions was taken into consideration in drawing inferences about the meaning of the factor structures. Overall, variance in Measured Achievement is most appreciably related to the dimensions Abstract Reasoning and Problem Solving, and Functional Information, Knowledge and Skill, and relationship with the other identified dimensions is minimal. It will be remembered from the above discussion that the Raven, and the Similarities subtest of the WISC, are most representative of Abstract

Reasoning, and that the SFTAA Verbal IQ and the WISC subtests Arithmetic, Information and Vocabulary are the best representatives of Functional Information, Knowledge and Skill.

The factor patterns for the different subtests of the CTBS, while similar, were not identical. For example, Reading Comprehension and Arithmetic Application, which probably represent the most complex and advanced skills of those represented by the subtests, were most clearly related to Abstract Reasoning-General and Verbal, and to Abstract Reasoning-General. Other subtest patterns reflected various differential balances of Functional Knowledge and Abstract Reasoning.

Variance and Correlation of Study Variables

Variance The constructs described in the preceding section can be used to account for variance in the primary measures used in the present study. The representations presented in the diagrams below are not precise, and the proportions of variance accounted for by the different constructs have reference only to identified variance, and the total variance in any given given measure cannot be accounted for by these constructs. Unidentified variance is theoretically due to error in measurement and unknown factors. The following abbreviations are used for the constructs: Conventional Behavior-CB; Functional Information, Knowledge and Skill-FI; Esoteric Information-EI; Abstract Reasoning-AR; Part-Whole Synthesis-PW; and Measured Achievement-MA.

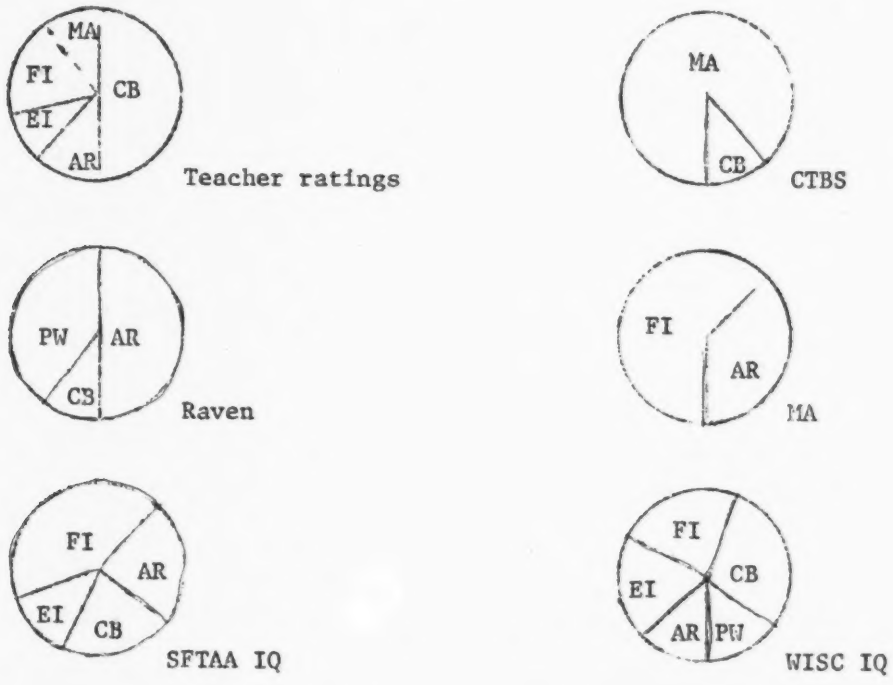

Figure 1. Proportions of Identified Variance Contributed by Constructs

VARIABLE	VARIANCE SOURCE				
	CB	EI	FI	PW	AR
Teacher ratings	xxx	x	xx		x
CTBS	x		xxx		xx
Raven				xx	xxx
SFTAA-Language	xx		xxx		x
WISC-Verbal					
Information		xx	xx		
Comprehension	xxx				
Arithmetic			xxx		
Similarities	x		x		xxx
Vocabulary		xx	xx		
Digits	xxx				
WISC-Performance					
Picture Completion	xxx				
Picture Arrangement	xxx	x		x	
Block Design		x		xxx	
Object Assembly		x		xxx	
Digit-Symbol	xxx				
Measured Achievement			xxx		xxx

Figure 2. Summary of Variance Components

x weak source of variance

xx moderate source of variance

xxx strong source of variance

Correlation It can be assumed that correlations among given variables occur because they measure one or more factors in common, and that the degree of relationship of any two variables is dependent on the extent to which each measures common factors. The constructs developed in the present study can be used to explain the relationships among the primary variables. In the diagram below, the study variables are represented by circles and the constructs which mediate the relation between any two variables are represented by boxes. The size of the section for any given construct is roughly equivalent to the proportion of common variance between any two variables for which that construct accounts. The strength of relationship between variables is depicted as: a single line, slight relationship; a double line, moderate; and a triple line, strong.

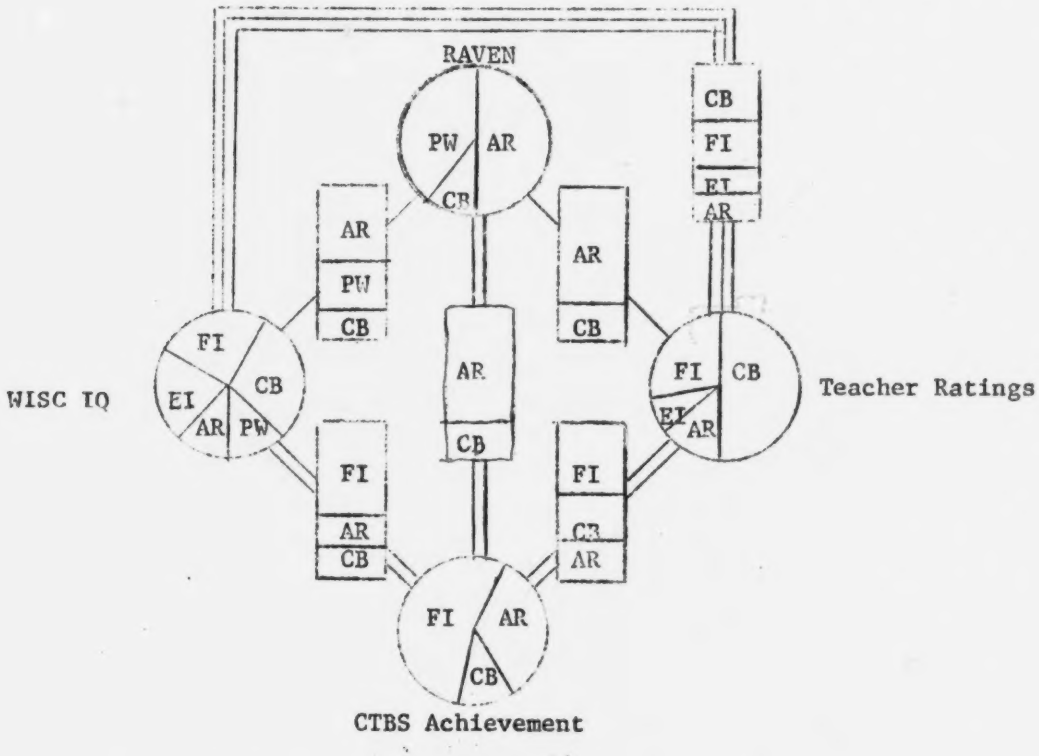

Figure 3. Degree of relationship between study variables

A Short Critique of Intelligence Tests

The intelligence tests used in the study appear to measure a number of different factors, many of which are not consistent with traditional definitions of intelligence as "abstract reasoning and problem solving". The WISC, which is now more widely used than the Stanford Binet in classifying children for placement in Special Education programs, appears to measure Abstract Reasoning only to a minor extent, while the Raven, which is seldom used, appears saturated with Abstract Reasoning. The correlation of WISC IQ scores with teachers' ratings of school success is primarily due to their common measurement of Conventional Behavior, and Functional Information, rather than to Abstract Reasoning. The correlation of WISC IQ and SFTAA IQ with CTBS scores is principally due to their common measurement of Functional Information, but not Abstract Reasoning.

Intelligence tests were initially devised to predict school success, and to serve as screening devices to eliminate from regular school programs those children whose chances of success were minimal. The selection of items which make up the content of intelligence tests was made primarily on the degree of their relation to school success. As a consequence, whatever factors determined school success were faithfully included in intelligence tests, and the validity of the tests was determined by their correlation with school success. The basic problem with this procedure is that many factors other than those described by the construct intelligence were involved in school success, and these "other" factors were inadvertantly included in intelligence tests. Subsequent development of intelligence tests has been modeled after the early editions. The most widely used

individual tests today, the WISC-WAIS, and the Binet, show strong kinship of content to the earliest tests. Now as then, they contain a conglomorate of factors, some clearly unrelated to almost anyone's definition of intelligence, but there now because they were there to start with. The common practice of validating newer tests as they were developed by correlating them with the WISC-WAIS and the Binet has helped to insure maintenance of traditional content.

There are certain other problems in the interpretation of intelligence test scores today that weren't particularly significant in the early periods. Back then, only selected segments of society were involved in intelligence testing; most were public school children, and most were from middle socio-economic class homes. Lower income students didn't go to school very long, and upper income students normally went to private schools. As a result, the children tested were from a rather homogeneous subculture with roughly the same background of relevant experience; so variation in test scores probably had at least some relation to ability to learn. Today, however, everyone by mandate goes to school and IQ tests are given to members of all social groups. Vast differences in relevant experience and cultural background (re. conventional behavior) contribute significantly to variance in IQ scores and obscure their relationship to ability to learn. Given the nature of contemporary intelligence tests, demonstration of IQ score differences between subcultural groups is an empty exercise in itself, and meaningless as a "scientific" rationale for genetic determination of intelligence.

It is apparent from the present study that intelligence tests measure "intelligence" only minimally, and that their extraneous content detracts appreciably from their usefulness in educational diagnosis. Further, correlations of IQ scores with more subjective measures of academic success such as teachers' grades are spuriously high due to their mutual contamination by nonintellectual, nonachievement factors which are distributed disproportionately among social subgroups. Students from socially advantaged homes, therefore, not only have the usual advantages to learning contributed by a supportive environment, but they have in addition the questionable advantage of biases built into IQ tests and subjective measures of school success.

It seems to the writers that there are no valid reasons for the continued use of the typical intelligence tests since they are contaminated by factors irrelevant to objectively measured academic achievement and unnecessarily biased against low income and minority groups. It is possible to develop new tests which are both relevant to academic performances and unbiased which provide separate and relatively pure measurement of Abstract Reasoning and Functional Information, Knowledge and Skill.

Discussion of Constructs

Functional Information, Knowledge and Skill (FI) The construct FI refers to the student's acquired pool of information, knowledge and skill which is relevant to the academic learning tasks he undertakes in school. In effect, it is that which is already learned which is immediately relevant to that which is to be learned. As such, FI at any given point in time constitutes a "readiness" base for new learning. It is useful to think of a general pool, FI-G, which is relevant to all aspects of academic curriculum and of specific pools, FI-S, which are relevant to specific learning tasks, for example, learning to do long division. The degree of specificity possible in the determination of FI-S is dependent only upon skill of the educational analyst in identifying the requirements of designated learning tasks.

In large part, FI determines the efficiency with which new learning can occur. If FI is low, learning will be slow; and if the disparity between FI and the requirements of the new task is too great, there can be no profitable interaction between the learner and the learning situation, and no new learning will occur. Some learning tasks are affected more than others. If learning is defined as the (1) adding to, (2) extension, (3) modification, or (4) combination and recombination of that which is already known (FI), then the efficiency of learning is affected by FI in this order. That is, low FI has least effect on the learning tasks which require the simple addition of new information to the existing pool, although the essential relatedness of new information to existing information is important. Situations may occur where certain components of FI are negatively related to the

requirements of the learning task. In that case, these components interfere with learning, reducing the efficiency of interaction of learner and learning situation.

Input to FI comes from sources both internal and external to the school. The primary source prior to school is from the home and neighborhood which continue to be important sources throughout all the school years. Considerable variance in FI, both prior to and during the school years, is therefore attributable to the relative richness of home and neighborhood FI sources and to the effectiveness with which the available FI is transmitted to the child. Differences in quality and quantity of available sources external to the school in large part determines variance in FI which in turn is related to variance in learning efficiency which is finally related to variance in academic achievement. Therefore, children from disadvantaged homes suffer depressed academic development because their readiness for undertaking the schools learning tasks is minimal.

Viewed developmentally, variation in students' FI has increasing importance with each successive school year. Since initially low FI results in less effective learning, smaller increments in FI will occur during the first year. Thus the second school year is begun with an even greater disparity between the students FI and that required by the learning tasks. This results in even smaller increments in FI during the second year. This process continues until the disparity between FI of the student and FI required by the curriculum is too great for any learning to occur, at which point growth in academic development virtually ceases. The sequence is

presented schematically below. The boxes represent FI, and the blackend portion of a box represents components of FI which interfere with effective interaction with the learning task.

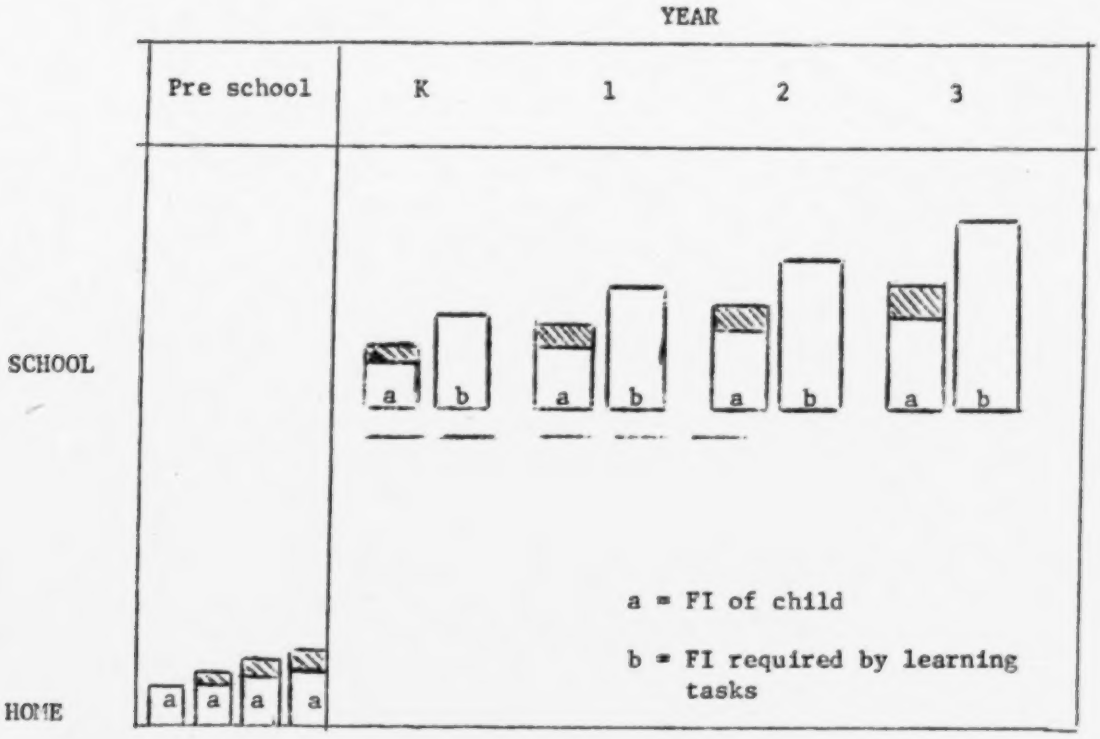

Figure 4 Developmental sequence in students' FI.

The above figure is illustrative of a particular developmental sequence typical of students who enter school with poor development in FI, and whose home and neighborhood do not contribute significantly to growth in FI over the school years. Variations in initial FI and amount of growth from sources external to the school would result in different developmental patterns. The relationships for the situation depicted above can be represented in the form of growth curves on the following page.

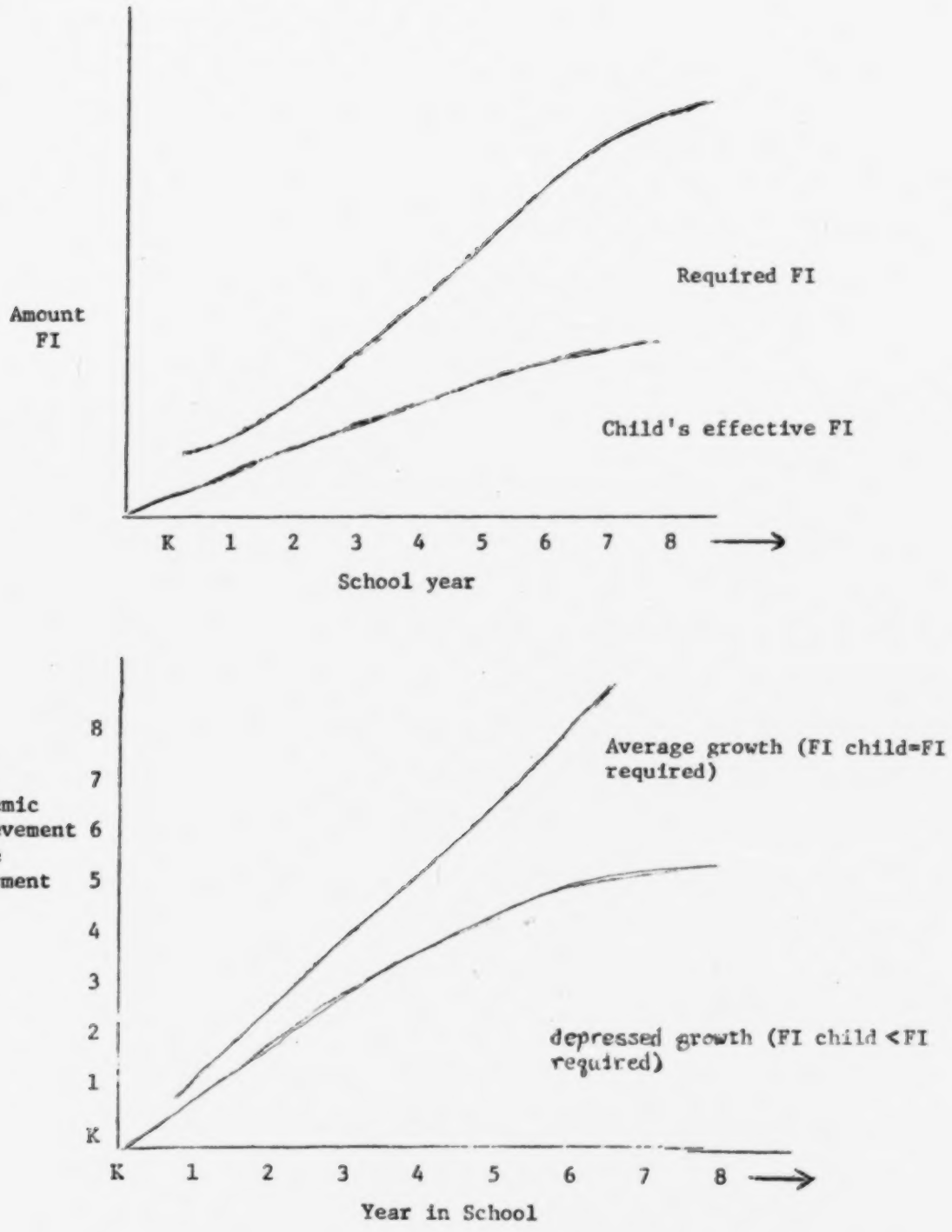

Figure 5 Growth curves depicting variations in initial student FI.

The achievement growth curve displayed above is typical of children from low income and minority group homes. The circumstances of such homes adversely effect the development of childrens' FI so that they begin school with a pool of information, knowledge and skill insufficient for effective interaction with the curriculum; and in contrast with children from more advantaged homes, these children receive less input to FI from their external environment during the school years. The effects of lowered FI are often quickly accumulative, and academic development curves approach an asymptote as early as the sixth grade.

A further comment should be made about information, knowledge and skill, acquired outside the school, which is negatively related to that which the student is to learn in school. Before new learning can occur, "unlearning" of the conflicting components must take place, the general conditions of negative transfer. Distinctive subcultural differences do exist in the definition of what constitutes appropriate information, knowledge and skill, and the subcultural definition is often at variance with the FI required at school both in terms of specific components and also in terms of their relative value or priority assignment. An obvious example of conflicting components is in language and usage. Gramatical construction, syntax, and even word meaning for the Indian child differs appreciably from the school's model; and even the intent underlying verbal communication may differ; i.e., in the Indian subculture language may be used for qualitatively different purposes. Consequently, language development, particularly as measured by the achievement subtests Language Mechanics and Language Expression, lags

behind the development of other academic skills. On the other hand, skill in arithmetical computation, which requires minimal language use, is the best academic performance area of the Indian students studied.

Differences in valuation and importance priorities of specific components of FI between school and subculture also exist for the Indian child. What the child identifies, from his subculture, as most meaningful and important often differs significantly from the school's top priorities. In such cases, the child is unable to perceive the relevancy of the learning tasks in schools to his life outside the school. The learning tasks, then, are less meaningful to him, his motivation is lower, and distinct feelings of alienation may develop. The situation becomes particularly severe when the subculture's top priorities, perhaps the areas of the child's highest level of development, aren't even represented in schools, or even worse, are negatively represented. In the latter case, the school becomes an alien and hostile situation for the child.

The development of measuring systems for the adequate assessment of both FI-G and the various FI-S's is sorely needed. The SFTAA, and the WISC subtests Information, Vocabulary, Arithmetic and Similarities do provide some measurement of FI, but scores derived from these tests are badly contaminated by the influence of irrelevant and biasing factors, e.g., EI and CB. Of the above, the SFTAA is the least offender and the WISC Vocabulary and Information the worst. If testing is to have any meaning it is necessary that specific tests giving relatively pure assessments of FI-G and FI-S be developed. The content of such tests is most sensibly derived from analysis of the requirements for general and specific learning tasks presented at each level in the school.

Such analysis is consistent with the new "behavioral objective and systems approach" fostered in California schools, and considerable headway already has been achieved in the area of arithmetic.

Esoteric Information (EI) The construct EI refers to information or knowledge which is assessed by IQ tests, but which is not relevant to the learning tasks in the academic skill areas. The presence of such content in IQ tests can be accounted for by examining some of the problems encountered in test construction. Since tests are intended to differentiate between individuals, it is necessary to select some items some persons will fail and others pass. This can be accomplished by the acceptable practice of including an extensive sample of a wide breadth of information. Variations in total scores will then reflect extensiveness of information, and if this information is relevant to a criterion, in this case academic achievement, then the test can be used effectively. Such a test is particularly useful if the information is grouped in subclasses enabling subscores which indicate relative amount of information by area. However, another technique is more often used to obtain individual differences in test scores. Instead of increasing the breadth of information tested, the test constructor adds items which are more "difficult," i.e. fewer persons get them right. This procedure makes some sense when the difficulty of the items are due to the complexity of the skill required for their solution, as long as that skill is what the test is intended to measure. In the case of information tests, however, it is hard to see how one piece of information is anymore "difficult" than another. Instead, it seems much more likely that the so called "difficulty" of the harder items (fewer pass than fail) derives from the rarity of the information sampled rather than its complexity.

Rarity, as used here, means that an individual would be less apt to come in contact with that information in the usual course of his daily life. Unfortunately in our society, "rarity of information" is much greater in some segments of society than in others. Urban areas provide more access than rural ones, and in a very profound way, that which we have called "rare information" is a prized possession of socially (and usually economically) advantaged homes where its access is virtually unlimited. As a consequence, variation in scores on information tests of this type primarily reflect differences in the access to rare information of the examinees, and most particularly, the degree of social and economic advantagedness.

All the predictor variables measure Esoteric Information (EI) to a certain extent, but by far the ones with the strongest measurement are WISC subtests Information and Vocabulary. Examination of the items of these two subtests readily establishes that the test constructors used the rarity technique to obtain a wide spread in test scores. Since these subtests contribute substantially to variance in the Verbal IQ, they are biased against disadvantaged subcultural groups in a particularly noxious way. If information tests which draw their rare information items from Indian culture were developed, they could be used to demonstrate that Indians have higher intelligence than middle class whites.

Teachers, and unfortunately many others, often confuse the possession of rare information with "brightness" or intelligence. If a child uses a rare word, or a big one, it is often remarked how bright he is. Teachers' ratings of proficiency in reading and math appear to be influenced by the amount of rare information a child expresses. While such influence contributes

significantly to the relation between teachers' grades and IQ test scores, it certainly contributes nothing to an understanding of the processes meaningfully related to objectively measured academic achievement.

Abstract Reasoning and Problem Solving (AR) The construct AR, of all those which emerged from the present study, is most congruent with traditional definitions of intelligence. In our analysis of predictor variables, however, only the Raven Progressive Matricies and the Verbal Similarities subtest of the WISC appeared to measure AR, and both of these tests measured other factors. Typical intelligence tests, therefore, seem to provide very minimal assessment of the construct which they purport to measure. Since AR was found to be significantly related to most achievement areas, particularly to the more complex skills (reading comprehension and arithmetic application), there is an obvious need for stronger and "purer" measurement of AR than is possible with existing instruments. As in other research findings, the Indian students in our sample, as a group, were at least average in AR as measured by the Raven. It can be concluded that Subcultural group differences in "IQ" scores are most probably due to other factors which the tests measure; FI, EI, CB, and P-W, which are affected in extreme by disparities in environmental advantages.

Considerable research of AR is needed to develop a more articulate definition of the construct and to study the factors effecting the development of this ability in children. Presently we can only define AR as processes of analysis, synthesis and perception of relatedness, and the application of these processes to the solution of practical problems. Greater specification is necessary. If the development of skill in AR is found to be susceptible to

environmental influence, then conditions could be arranged to facilitate its growth. It seems possible that abstract reasoning ability is not particularly noticed or even valued in everyday life, particularly in the child's school life. Teachers' ratings of their students' intellectual potential and their estimates of future educational and occupational success were only minimally related to measures rich in AR. It also seems possible that the learning format typical of most elementary school curricula deemphasizes the use of abstract reasoning, and instead emphasizes "simpler" associative learning which probably requires higher CB (following section). Intensive utilization of associative learning processes may not only restrict the use of AR, but actually inhibit its development.

Conventional Behavior (CB) The activities of the school appear to be directed toward two distinct kinds of development-the acquisition of academic skills and the conventionalizing of behavior. Teacher's ratings of their students' school success reflects both kinds of development, but unfortunately in an ambiguous way, in that both factors in combination influence their judgments of actual achievement in academic skill. For example, imagine two children who have exactly the same academic achievement level, but child A has highly developed conventional behavior, while child B is less well developed in this respect. It is hypothesized that A will receive a teacher rating (grades) for achievement higher than his actual level, and B will receive a rating lower than his true level. This will occur not because of deliberate intent on the part of the teacher but as a result of failure to differentiate between the two types of behavior. In fact, it is highly probable that no clear differentiation between the two kinds of development occurs at all within the school system.

Assume further that the above process is constantly in action throughout the child's school career. Child A will receive more reinforcement for his learning behavior than Child B, in terms of daily recognition, grades, and parental approval. Over time, A's achievement motivation will increase, his confidence in his ability to learn increase, and his rate of academic development will probably accelerate. Child B, however, not only receives less reinforcement than A, his actual achievements (academic) are under-recognized and under-reinforced. Over time B's achievement motivation will drop, his self confidence diminish, and his rate of academic development will decrease. In time child B's academic development may virtually cease since he will lack sufficient self confidence to learn; he will be significantly below grade level in achievement, and he will appear bored and apathetic in the classroom. Since these characteristics are the antithesis of conventional behavior, B then finds himself in possibly triple jeopardy-he is failing both parts of the curriculum and in addition may be in serious trouble at home as a consequence of his failure. His teachers' earlier predictions of low academic achievement, and low occupational status, based primarily on his poor showing in conventional behavior, are well on their way to being fulfilled.

The matter of conventional behavior needs closer examination. It has long been known that our society is not homogeneous in its composition, but instead is composed of a number of distinctive subcultures. While these subcultures do share some common values, there are also significant differences between groups. There is a "norm", however, against which the value structure of any group is evaluated. These normative values probably do not represent a synthesis of the diverse subculture group values, but rather are consistent

with the values of the oft-mentioned "white middle class." Many racial and ethnic minority groups, and even low-low income white groups have value systems which are sufficiently different so as to be in conflict with normative values.

The constellation of behavior that we have named "conventional" is the observable manifestation of the value system of a cultural group. In so far as value differences exist between cultural groups then so will the models for conventional behavior differ, and the greater the value disparity, the greater the behavior differences. Thus the term conventional behavior is meaningful only in reference to the cultural group from whose values it is derived. The values implicit in the public school system appear to be most consistent with the aforementioned normative social values, in fact, they seem to represent somewhat stringent, overstated representations. (Look at the "rule" books for students and teachers). The particular conventional behavior model pervading all aspects of the school system, then derives from normative social values, and it is this model which is implicit in teachers' evaluations of their students. Parenthetically, it is this same model which is represented in most "intelligence" tests.

If a child initially comes to school from a home whose cultural values are consistent with those of the school, and if his parents have been effective value transmitters, then he will be well advanced in the development of those conventional behaviors which are consistent with the school's model. Further, his continued growth (conventional behavior) will be nurtured by the home, and his advantage will be maintained. In effect, the child has two learning

centers, school and home, dedicated to the development of the same dimensions of conventional behavior which are so important in the school setting. On the other hand, consider the circumstances of a child whose family belongs to a subcultural group whose values, and consequent models for conventional behavior, differ appreciably from the normative models of the school. Such is certainly the case for many Indian children. Although the child's behavior may be consistent with that of his own cultural group model, his behavior is not only underdeveloped but in even conflict with the school's model. Certain consequences are obvious. As described in the immediately preceding section of this paper, low conventional behavior, school's model, leads to an underestimation of actual achievement, fewer reinforcements and deccelerated development. There are, however, other consequences which may be more important, and these concern the child's reaction to the conflict between home and school values and models of conventional behavior. The child may be punished (or corrected, guided, not reinforced) for behavior which is "natural" to him because of its consistency with the home or subcultural model, but which is inconsistent with the school's model. The child's first reaction is confusion; he can't understand what's wrong, but something obviously is. His second stage of reactions are feelings of inferiority and diminished self confidence; "Others are being rewarded. I am not, is something wrong with me?" His third stage of reactions are alienation; "I am different, I don't belong here". His final reactions are withdrawal, at first psychological because his physical presence in school is demanded by law; but then, as soon as he can, he finalizes the process by dropping out of school. He leaves, moreover, confused about himself, with feelings of inferiority and alienation, and with poorly developed academic skills-not much with which to meet the world.

Somewhere along the line, either by subtle (or overt) communication from his teachers, school peers or even his parents, or through his own perceptiveness, the child may learn that the source of his difficulties is not personal and unique to him, but due to being "Indian". Unfortunately in too many cases, his negative feelings about himself transfer to his impression of what Indians are. Thus "being Indian" to him comes to mean being confused, inferior and alienated, which is anything but a positive cultural identify. If forces intervene to establish a positive subcultural identity, the child may come to feel that the values and conventional behavior of his group, although different from those represented in the school, are at least equal or even better. But under the present circumstances, the school will continue to value and reward behavior in terms of its conformity to the normative model, and in fact, is probably unaware that there is any other. Thus, as things now are, if the child is to succeed in school, despite all the odds against him, he will probably have to give up, at least superficially, the values and conventional behavior of his subcultural group, but only with uncertain personal consequences. Not only is he lost to his subculture, and his subculture lost to him, but his feelings of personal identity are on and will remain on, very shaky ground.

It has become more or less accepted practice today for schools, elementary, high school and college, to insert "minority group programs" and ethnic studies into their curricula. At the same time, however, the schools do not change their traditional model of acceptable conventional behavior which continue to play their vital role in the determination of school success. If by chance, the minority programs are successful in helping minority students achieve a positive subcultural identity, minority students will express more vigorously

the conventional behavior of their subculture, behavior that is often in conflict with the school's model. Furthermore, the establishment of identity involves not only the acceptance of certain values, but also the rejection of others. If the minority student rejects school favored values (and behavior) in favor of those of his subculture his position in the school may be jeopardized. Unless schools can modify their models of conventional behavior along with their introduction of minority group programs, not much good will be accomplished. The problem is, and has been, a narrow and dogmatic ethnocentism on the part of schools, where its values, and models of conventional behavior, are regarded as being universally right for all students.

Summary

(1) The investigators found three primary factors to be related to academic performance; abstract reasoning (AR); functional knowledge, information and skill (FI); and indirectly, conventional behavior (CB). Indian students, as a group, have average or above ability in abstract reasoning, but are lower in FI and CB, and these latter two factors are hypothesized to be primarily responsible for their lower achievement levels.

(2) Existing psychometric instruments do not provide adequate measurement of any of the three relevant factors (AR, FI, CB) and in fact are badly contaminated by factors which are irrelevant to school performance and negatively related to socioeconimic status. Thus, they are discriminatory against disadvantaged groups in a nonmeaningful and unnecessary way.

(3) Teachers' rating of performance and potential are influenced by factors irrelevant to actual academic proficiency. If grades and other evaluations given by the teacher to the students are similarly influenced, reinforcement for actual achievement may be minimal.

(4) There is an urgent need for better definition and measurement of the three primary factors related to achievement, and to a study of their effects over the school years. Such research would point to the way toward more effective interventive educational programs, provide for more accurate diagnosis of group and individual learning problems, and enable more meaningful classification of students of educable mentally retarded (EMR) and educationally handicapped (EH) programs.

An Academic Achievement Model

The investigators feel that they have identified three primary factors which are functionally related to academic development. Various levels of individual achievement are hypothesized to be a consequence of different degrees of strength in these primary factors. Further, related phenomena such as student absenteeism, low achievement motivation, alienation from school, low occupational aspiration, and high dropout rates typical of Indian students are hypothesized to be a function of low strength in FI and CB. The factors are presently in the construct stage, although they have the virtue of being empirically derived; and with further study, they can be reduced to observable processes. The investigators plan to continue their research along the following lines:

(1) Develop clearer definition of each construct and its principle components.

(2) Develop measurement systems for each construct so that individual student and group strengths and weaknesses can be assessed.

(3) Validate factor measurements against achievement criteria, and determine the optimal weights assigned to each factor in the multiple regression equation to predict achievement.

(4) Investigate relation of factor measures to other pertinent variables such as parent interview information, school records, and attitudes of students toward self, school, and society.

As a research guide, the investigators have developed a model for academic achievement. If continued research confirms the relation of the three primary constructs to academic achievement, the model will provide a precise explanation of variance in school success. The model could then

be applied to three basic educational problems: (1) the analysis of low achievement patterns of disadvantaged groups to identify the factors critically responsible, the design and implementation of interventive programs to correct the critical areas; (2) diagnosis of individual learning problems by systematic assessment of those factors relevant to achievement, prescription of effective treatment of problems by designating critical weaknesses; and (3) classification of students for EH and EMR programs by more accurate measurement of factors relevant to achievement and learning ability.

The achievement model appears as follows:

(1) achievement = f [AR | FI | CB]

(2) achievement = f [FI | AR | CB]

(3) achievement = f [CB | AR | FI]

These statements mean that if any two construct values are held constant, variance in academic achievement is a function of variance in the third construct value. Likewise any two constructs can interact with the other while the third is held constant.

(4) achievement = f [AR x FI | CB]

(5) achievement = f [AR x CB | FI]

(6) achievement = f [FI x CB | AR]

These statements mean that if any one construct is held constant, then achievement is a function interaction of the two which are free to vary. For example, statement (4) means that if the value of CB is held constant, then

variations in achievement are a function of the interaction of possible values of AR with possible values of FI. To illustrate, high AR and high FI would result in optimal achievement, while low AR and FI would result in minimal achievement. Intermediate achievement levels would result from various combinations of possible FI and AR values. Finally, all three constructs are free to vary so that achievement is a function of interaction between AR, FI and CB.

(7) achievement = f [AR x FI x CB]

Statement (7) must be modified slightly to fit certain points mentioned in earlier discussion; namely that conventional behavior that is acquired from the subcultural groups may conflict with the model approved by the school, and similarly, that certain functional information, knowledge or skill acquired from home, neighborhood or subcultural group may interfere with that required in the learning tasks set by the school curriculum. These relationships are represented as simple subtractions.

(a) CB_s-CB_g; CB_s is behavior consistent with school's model and CB_g is behavior derived from cultural group which is in conflict with school's model.

(b) FI_s-FI_g; FI_s is general information, knowledge and skills required by learning tasks at school, and FI_g is the same which is contradictory to that which is required.

Statement (7) now is modified so that:

(8) achievement = f [AR x (FI_s-FI_g) x (CB_s-CB_g)]

Statement (8) refers to general school achievement. Specific achievement in a designated skill area or course would require, in addition to FI_s general, unique readiness components which can be designated as FIS. For such specific achievement, the statement would be:

$$(9)\ \text{specific achievement} = f\ [[AR \times (FI_s - FI_g) \times (CB_s - CB_g)] \times [FIS_s - FIS_g]$$

Statement (9) means that variance in achievement in a specific academic area or skill is a function of any given product of the terms in the ( ) interacting with various possible levels of FIS. Both statements (8) and (9) have reference to achievement assessments made at any given point in time. Growth models can be generated by using the symbol k to stand for the parameters of the growth curves for each construct. Although actual parameters would differ for each construct, the symbol k is attached tc each without identifying subscripts. The growth models appears as:

$$(10)\ (k)\ \text{achievement} = f\ [(k)\ AR \times ((k)\ FI_s - (k)FI_g) \times ((k)CB_s - (k)CB_g)]$$

$$(11)\ (k)\ \text{specific achievement} = f\ [(k)\ AR \times ((k)FI_s - (k)FI_g) \times ((k)CB_s - (k)CB_g)] \times [(k)FIS_s - FIS_g]$$

Practical Uses of Achievement Model

Each of the constructs used in the statements is susceptible to clear operational definition; each lends itself to measurement; and each can be manipulated (its value varied) by external control. These, then, are workable constructs which can be manipulated on one side and measured on the other. The outcome of deliberately varied strength in any construct is reflected, moreover, not only in changes in its measured value, but also by changes in measures of achievement.

Educational Programs The model would be very useful in designing programs to improve the achievement levels of groups of students who have some common characteristics, for example, Indian students. Assuming that measuring systems had been developed for each construct, baseline measurement could be obtained for each construct including, of course, academic achievement. If general academic achievement for the group was low, one would utilize the general achievement model as a guide, and similarly if the achievement in a particular area were low, the specific achievement model could be utilized. The k values for the growth curves could be obtained by plotting the mean construct values by grade from K-8, for example. Since Indian students have been shown to have at least average abstract reasoning ability (AR), the place to go to work would probably be with FI and CB. The following approaches to raising FI and CB (thus academic achievement) are possible.

(1) Functional Information, Knowledge and Skill

(a) Lower discrepancy between FI_s and FI_g by adjusting curriculum and teaching methods to make FI_s more compatible with FI_g.

In short, enable the students' functional information, knowledge, and skills which they acquire from their homes, neighborhood and cultural group to become a more integral part of the curriculum. This action should not only enable faster learning, but also enhance the meaningfulness of the learning tasks by increasing their relevance to the students' lives outside of school. Utilize representatives of the Indian culture in schools as teachers, aides, and speakers. Educate nonIndian teachers in Indian culture.

(b) Increase input of FI_s by planned preschool, school, home, and community programs. Be sure to just "input" <u>essential</u> FI_s components, don't worry about "cultural enrichment." The Indians already have a culture, and cultural enrichment too often has meant the building of esoteric information (EI).

(c) Increase input of FI-S through mini programs and small, special instruction groups for students with special difficulties in particular academic areas.

(2) Conventional Behavior

(a) It is critical that teachers separate their impressions of their students' CB from their judgments of the students' academic growth. Academic growth should be reinforced on an systematic basis independent of the child's status on CB. Grades should reflect <u>only</u> academic growth, even if CB is atrociously low. Well planned achievement testing programs would help.

(b) Reduce discrepancy between school's model of conventional behavior and that of the child's home, community, and cultural group (Indian). The school as a whole, and individual teacher's as well, should carefully examine their models of conventional behavior for unnecessary ethnocentric bias, excessive rigidity, and proliferation. Streamlined models should be developed containing only those components which constitute essentials. If necessary, school activities should be rearranged so they require less severe restrictions on the student's behavior. School and parents should meet frequently to develop together an acceptable model of conventional behavior. Components of the subcultural model should be incorporated in the school's model.

(c) Many learning tasks should be restructured to employ more fully the students' capabilities in abstract reasoning. Associate learning (drill, memory, elemental) requires significantly more CB. The students should learn faster, remember longer, and require less control if AR is emphasized.

(d) Control the development of essential CB by reinforcing positive responses when they occur, rather than by an elaborate system of punishments for inappropriate behavior.

There are many other things which could be done depending upon the unique requirements of particular situations. The effectiveness, of any specific operation can be assessed by measuring changes in the strength of the construct to which the activity was addressed. Such changes should then

result in increased achievement. Overtime, the k (growth) functions of the growth curves (for each construct and academic achievement) should change so that rate of development increases, and the early asymptote disappears. Careful attention to each construct and its development should enable trouble spots to be detected and remedied. The consequences of such actions would be cumulative. First year growth would be small, but larger increments could be expected with each successive year. For obvious reasons, most of the suggestions would have the greatest immediate impact in the early elementary years.

Diagnosis and classification The model can be useful in the diagnosis of learning problems and in the classification of children for special programs when it systematically is used as a "map" for searching for and identifying those factors which are primarily responsible for the lowered academic achievement. Such specific identification would also suggest more clearly than is usual, those courses of action which would be most effective in remedying the learning problem. Application of the model to several types of diagnostic situations is discussed briefly below.

(1) Educable Mentally Retarded Classification of children for placement in special programs as educable mentally retarded is made now primarily on the basis of low performance in academic achievement and low IQ score (55-75). Initial recommendations for classification are usually from teachers who have observed particularly slow academic progress for a given student. Presumably, the decision for placement finally rests on whether or not the child has sufficient

intelligence to profit from the usual classroom experience, and the IQ score is assumed to be indicative of the degree of the child's intelligence. There are a host of problems with this procedure.

Since achievement (measured) = f [AR x FI x CB], lowered academic performances can be a function of anyone of the three factors or their interaction.

Since teachers evaluations are based on CB, FI, EI, and only to a small extent on AR, then their recommendations are at least ambiguous, if not misleading.

And since intelligence tests (such as the WISC) measure FI, EI, P-W, and AR, and since AR is the only logical equivalent of intelligence as defined, then any given IQ score reflects AR to only a minor extent.

Given the above, any combination of low IQ score and low academic achievement couples with low teacher evaluations of progress could easily be the consequence of hundreds of possible combinations of factors other than AR (intelligence). Therefore, the probability is high that current diagnostic and placement procedures result in many children being placed in EMR programs who are not mentally retarded, but have instead, lowered FI and CB.

Accurate diagnosis could be made on the basis of independent assessments of AR, FI and CB, and the primary decision for placement

in an EMR program would be low scores on AR. The need for the development of instruments is urgent, but easily within the scope of present psychometric technology. Further research is needed to determine what kinds of experience facilitate the development of AR, and it should not be assumed without study that AR is a fixed attribute of individuals. A "systems" approach to diagnosis should be developed so that specification of each factor and its relevance to the criterion (academic performance) could be made.

(2) Educationally Handicapped Classification of students for placement in Educationally handicapped programs are made principally on the bases of (a) average intelligence (b) low academic achievement, general and specific, (c) poor social adjustment to the classroom, and sometimes (d) possible neurological malfunction. Some of the same problems associated with diagnostic procedures for EMR classification are also inherent in EH diagnosis, and could be solved in the same way. It is recommended that the primary basis for placement in EH programs be low FI, general and specific. Poor classroom adjustment is probably equivalent to low CB and should be considered (independently of FI) in both diagnosis and remediation. Neurological disorders should not be presumed unless specific evidence obtained through expert examination can be obtained.

(3) Diagnosis of special, individual learning problems In some instances a student may be doing satisfactory work in most academic areas, but experience difficulty in a single area. Such special

learning disabilities could be diagnosed by using the specific achievement model (statement (9)) as a guide. All constructs should be assessed, but special attention directed to analysis of FIS. Since general achievement is regarded as adequate, then [AR x (FI_s-FI_g) x (CB_s-CB_g)] must result in a sufficiently high value; therefore performance in a specific academic area is most like a function of low specific readiness (FIS) for that area.